

Two New Species of the Genus *Allocreadium* (Digenea, Allocreadiidae) from a Freshwater Fish in Nagano, Central Japan

Takeshi Shimazu

Nagano Prefectural College, 8–49–7 Miwa, Nagano, 380–8525 Japan
e-mail: shimazu@nagano-kentan.ac.jp

Abstract Two new species, *Allocreadium shinanoense* sp. nov. and *Allocreadium aburahaya* sp. nov. (Digenea, Allocreadiidae), are described on the basis of adults found in the intestine of a freshwater fish, *Phoxinus lagowskii steindachneri* Sauvage (Osteichthyes, Cyprinidae), caught in the Hiroi River at Kotobuki, Iiyama, Nagano Prefecture, central Japan. *Allocreadium shinanoense* is most closely similar to *A. tosai* Shimazu, 1988, but it is different from the latter in having a larger body, a longer eversible ejaculatory duct, a more anterior extent of the vitelline follicles, and a shorter excretory vesicle. *Allocreadium aburahaya* is closely similar to *A. tribolodontis* Shimazu & Hashimoto, 1999, but it is different from the latter in having a larger sucker width ratio, irregularly indented testes, an ovate cirrus pouch, and larger eggs.

Key words: *Allocreadium shinanoense*, *Allocreadium aburahaya*, new species, Digenea, *Phoxinus lagowskii steindachneri*, Nagano, central Japan

Introduction

The digenean genus *Allocreadium* Looss, 1900 (Allocreadiidae) consists of many species parasitic chiefly in the intestine of freshwater fishes (Koval', 1966). In Japan five species and eight unidentified specimens of the genus have been known from freshwater fishes (Shimazu, 1988; Shimazu & Hashimoto, 1999). In this paper I describe two new species of the genus found in a freshwater fish from Nagano Prefecture, central Japan.

Materials and Methods

Large numbers of freshwater fishes were collected in the Hiroi River at Kotobuki, Iiyama, Nagano Prefecture, central Japan, at irregular intervals from October 1995 to November 2000 and examined for helminth parasites. Of about 90 specimens (45–115 mm in standard body length) of *Phoxinus lagowskii steindachneri* Sauvage (Osteichthyes, Cyprinidae) examined during this study, two were infected with digeneans described as two new species below, one fish with

one digenean species each, both caught on 12 June 1999. Other results obtained will be published elsewhere.

Specimens of the digeneans were slightly flattened, fixed with AFA, stained with Heidenhain's iron hematoxylin, and mounted in Canada balsam. Drawings were made with the aid of a drawing tube. Measurements are given in millimeters unless otherwise stated. The specimens studied have been deposited in the National Science Museum, Tokyo (NSMT).

Allocreadium shinanoense sp. nov.

Two gravid specimens were found in the intestine of one fish (55 mm in standard body length). Two whole-mounted specimens were measured.

Description (Figs. 1–3). Body (Fig. 1) elongate, 3.74–3.80 long by 1.16–1.20 wide. Tegument smooth. Eyespot pigment not seen. Oral sucker globular, subterminal, 0.38–0.41 long by 0.41–0.42 wide. Prepharynx almost absent. Pharynx elliptical, 0.17–0.19 long by 0.18–0.19 wide. Esophagus 0.19–0.27 long. Intestinal ceca terminating some distance from posterior end of body.

Ventral sucker globular, located at about junction of anterior and middle thirds of body, immediately posterior to intestinal bifurcation, 0.55–0.57 long by 0.53–0.57 wide; sucker width ratio 1: 1.28–1.35. Testes elliptical, with somewhat irregular outline, slightly oblique, slightly separated, in middle third of hindbody; anterior testis 0.35–0.47 long by 0.26–0.44 wide; posterior one 0.43–0.55 long by 0.31–0.39 wide. Cirrus pouch (Fig. 2) claviform, 0.39–0.51 long by 0.13–0.14 wide, enclosing a clavate seminal vesicle, a globular pars prostatica surrounded by numerous small prostatic cells, and an everted long ejaculatory duct. Genital atrium small. Genital pore median, immediately anterior to intestinal bifurcation. Ovary globular, with somewhat irregular outline, median, slightly posterior to ventral sucker, 0.27–0.33 long by 0.39–0.33 wide. Seminal receptacle (Fig. 3) ovate, submedian, between ovary and anterior testis, 0.23–0.27 long by 0.13–0.16 wide. Laurer's canal short, running forward. Ootype postovarian. Uterus extending posteriorly to mid-level of posterior testis; metraterm well developed, short. Eggs operculate, numerous, 88–96 by 58–64 μm , not embryonated when laid. Vitelline follicles large, distributed from pharyngeal level to posterior end of body, separated anteriorly, confluent in post-testicular region of body. Excretory vesicle I-shaped, reaching anteriorly to posterior border of posterior testis; excretory pore terminal.

Type host. *Phoxinus lagowskii steindachneri* Sauvage (Osteichthyes, Cyprinidae).

Site of infection. Intestine.

Type locality. Hiroi River at Kotobuki, Iiyama, Nagano Prefecture, central Japan.

Type specimens. Holotype and one paratype (NSMT-PI 5227).

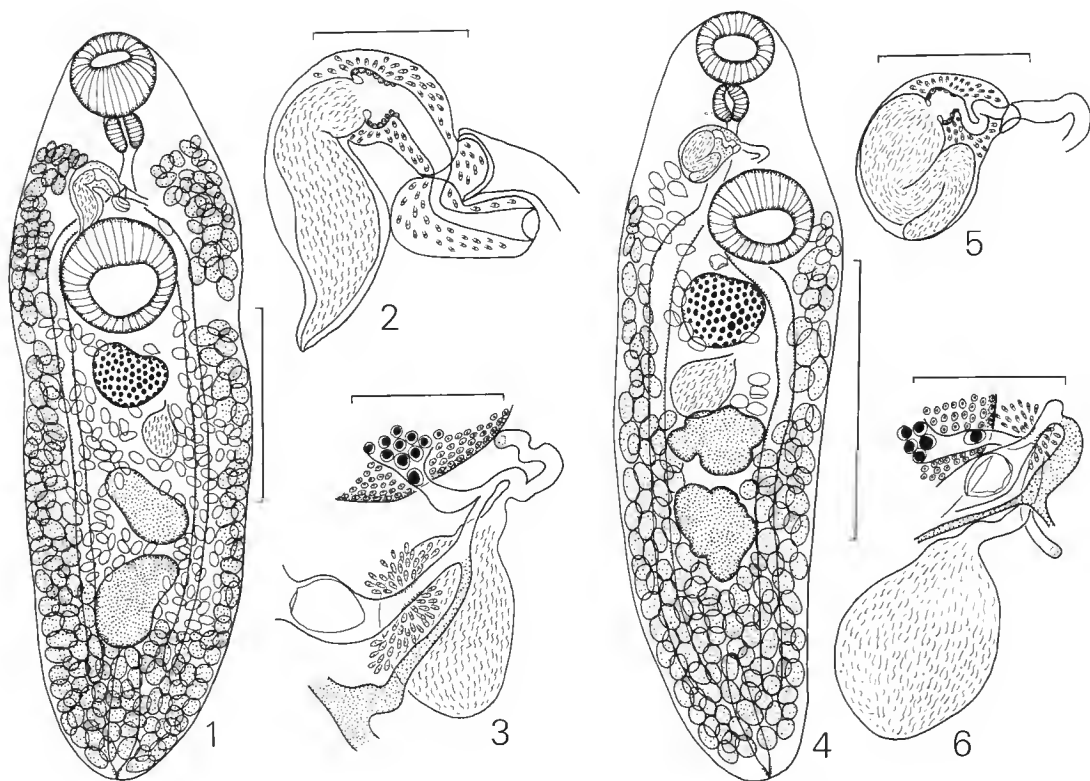
Etymology. The specific name "*shinanoense*" is derived from the old name "Shinano" for Nagano.

Discussion. *Allocreadium shinanoense* sp. nov. is most closely similar to *A. tosai* Shimazu, 1988 as described by Shimazu (1988) from the intestine of *Tribolodon hakonensis* (Günther) (now *T. hakuensis*), *T. ezoe* Okada & Ikeda, and

Moroco percnurus sachalinensis (Berg) (now *Phoxinus percnurus sachalinensis*) (all Cyprinidae) from eastern Hokkaido, Japan. However, the former is different from the latter in having a larger body (3.74–3.80 mm long by 1.16–1.20 mm wide instead of 1.00–2.90 mm long by 0.42–0.88 mm wide), a longer eversible ejaculatory duct, a more anterior extent of the vitelline follicles (to the pharyngeal level instead of to the mid-level of the esophagus), and a shorter excretory vesicle (reaching to the posterior border of the posterior testis instead of to the mid-level of the posterior testis).

Park (1939) described two new species, *Macrolecithus elongatus* and *M. phoxinusi*, from *Phoxinus lagowskii* (Dybowski) from Sinsen, North Korea. Shimazu (1988) transferred these two species and *M. indicus* Gupta & Agrawal, 1967 from India to the genus *Allocreadium*. He used species names, *A. elongatum* and *A. phoxini* [sic], without clearly giving new combinations for these three species. Their species names are: *Allocreadium elongatum* (Park, 1939) Shimazu, 1988, not (Akhmerov, 1960) Koval', 1966; *A. phoxinusi* (Park, 1939) Shimazu, 1988; and *A. indicum* (Gupta & Agrawal, 1967) Shimazu, 1988. Park's (1939) original spelling "*phoxinusi*" is correct and preserved, but Shimazu's (1988) spelling "*phoxini*" is an incorrect subsequent spelling (Code, Arts. 32.2., 32.3., and 33.3.). Since *A. elongatum* (Akhmerov, 1960) Koval', 1966 (formerly *Neoallocreadium elongatum* Akhmerov, 1960) is a junior homonym of *A. elongatum* (Park, 1939) Shimazu, 1988, it is rejected. The former has a junior synonym, *N. pseudaspisii* Akhmerov, 1960 (see Koval', 1966). Accordingly, its species name is replaced by *A. pseudaspisii* (Akhmerov, 1960) Koval', 1966 (Code, Art. 60.2.).

The present new species also is somewhat similar to *A. phoxinusi* as described by Park (1939); *A. baueri* Spasskii & Roitman, 1960 as described by Spasskii & Roitman (1960) and Koval' (1972) from *P. phoxinus* (L.), *P. czecanowskii* Dybowski, and *Rutilus rutilus lacustris* Pallas from the Enisei River basin, Russia; and *A. papilligerum*



Figs. 1–3. *Allocreadium shinanoense* sp. nov., whole-mounted holotype. 1. Entire body, ventral view. 2. Terminal genitalia, ventral view. 3. Ovarian complex, ventral view.

Figs. 4–6. *Allocreadium aburahaya* sp. nov., whole-mounted holotype. 4. Entire body, ventral view. 5. Terminal genitalia, ventral view. 6. Ovarian complex, ventral view.

(Scale bars: 1 mm in Figs. 1 and 4; 0.2 mm in Figs. 2, 3, 5, and 6.)

(Rees, 1968) Moravec, 1984 as described by Rees (1968) and Moravec (1984) from *P. phoxinus* (L.) from Europe. However, the former is separated from the latter three by having a more anterior extent of the vitelline follicles (to the pharyngeal level instead of to the mid-level of the esophagus).

The new species was not found in any of the other fish, including about 200 specimens (45–220 mm in standard body length) of *T. hakuensis*, examined during this study (my unpublished data). This suggests that the new species is specific to *P. lagowskii steindachneri* though its occurrence was very rare.

Allocreadium aburahaya sp. nov.

Eighteen gravid specimens were found in the

intestine of the other fish (85 mm in standard body length). Ten whole-mounted specimens including the holotype were measured.

Description (Figs. 4–6). Body (Fig. 4) elongate, 2.56–2.90 long by 0.66–0.80 wide. Tegument smooth. Eyespot pigment scattered on both sides of anterior part of esophagus. Oral sucker globular, subterminal, 0.23–0.26 long by 0.26–0.30 wide. Prepharynx almost absent. Pharynx elliptical, 0.12–0.14 long by 0.11–0.12 wide. Esophagus 0.24–0.35 long. Intestinal ceca terminating some distance from posterior end of body. Ventral sucker globular, located slightly anterior to junction of anterior and middle thirds of body, at about intestinal bifurcation to just posterior to it, 0.29–0.33 long by 0.32–0.39 wide; sucker width ratio 1:1.23–1.36. Testes irregularly indented, tandem, slightly separated, in middle

third of hindbody; anterior testis 0.27–0.31 long by 0.15–0.23 wide; posterior one 0.28–0.39 long by 0.19–0.31 wide. Cirrus pouch (Fig. 5) ovate, 0.19–0.25 long by 0.12–0.16 wide, enclosing an S-shaped seminal vesicle, a globular pars prostatica surrounded by numerous small prostatic cells, and a short ejaculatory duct. Genital atrium small. Genital pore median, located at about mid-level of esophagus. Ovary globular, with somewhat irregular outline, median, slightly posterior to ventral sucker, 0.26–0.31 long by 0.21–0.27 wide. Seminal receptacle (Fig. 6) ovate, located between ovary and anterior testis, 0.18–0.33 long by 0.14–0.30 wide. Laurer's canal short, running backward. Ootype postero-sinistral to ovary. Uterus extending posteriorly usually to anterior testis but sometimes to mid-level of testicular region of body; metraterm well developed, short. Eggs operculate, fairly many, 76–86 by 54–60 μm , not embryonated when laid. Vitelline follicles large, distributed from bifurcal level to near posterior end of body, separated anteriorly, confluent in post-testicular region of body. Excretory vesicle I-shaped, extending anteriorly to mid-level of post-testicular region of body; excretory pore terminal.

Type host. *Phoxinus lagowskii steindachneri* Sauvage (Osteichthyes, Cyprinidae).

Site of infection. Intestine.

Type locality. Hiroi River at Kotobuki, Iiyama, Nagano Prefecture, central Japan.

Type specimens. Holotype and 17 paratypes (NSMT-PI 5228).

Etymology. The specific name “*aburahaya*” is derived from the Japanese common name “*aburahaya*” of the host fish species.

Discussion. *Allocreadium aburahaya* sp. nov. is closely similar to *A. tribolodontis* Shimazu & Hashimoto, 1999 as described by Shimazu & Hashimoto (1999) from *Tribolodon ezoe* from eastern Hokkaido and from *T. hakuensis* (= *T. hakonensis*) from Tohoku, Japan. However, the former is different from the latter in having a larger sucker width ratio (1 : 1.23–1.36 instead of 1 : 1.05–1.30), irregularly indented (instead of smooth) testes, an ovate (instead of a claviform)

cirrus pouch, and larger eggs (76–86 by 54–60 μm instead of 60–80 by 48–62 μm). These differences are slight. As already shown, the new species was not found in about 200 specimens of *T. hakuensis* examined during this study. This absence may support the distinctness of the new species from *A. tribolodontis* because the latter is a parasite of *T. hakuensis* (see above).

The new species also is similar to *A. elongatum* (Park) as described by Park (1939) from *P. lagowskii* from Sensen, North Korea. However, the former is distinguished from the latter by having a larger body (2.56–2.90 mm long by 0.66–0.80 mm wide instead of 1.89 mm long by 0.42 mm wide), a larger sucker width ratio (1 : 1.23–1.36 instead of 1 : 1.09 calculated from Park), a more anterior genital pore (located at about the mid-level of the esophagus instead of at about the bifurcal level, as shown in Park's text-fig. 1), a more anterior extent of the vitelline follicles (to the pharyngeal level instead of to the bifurcal level), and a longer excretory vesicle (extending anteriorly beyond the posterior ends of the ceca instead of nearly to them). The new species also is somewhat similar to the unidentified specimens found in *P. lagowskii oxycephalus* (Sauvage & Dabry) from Primorskiĭ Kraĭ, Russia (Belous, 1952); and in *Chaenogobius annularis* Gill (the middle reaches type) (now *Gymnogobius opperiens* Stevenson) (Gobiidae) from northern Hokkaido (Shimazu, 1988).

Possibly, the new species also is specific to *P. lagowskii steindachneri* because it was not found in any of the other fish examined during this study (my unpublished data).

Acknowledgments

I thank Prof. Teiji Kifune, Fukuoka University, Fukuoka, for valuable suggestions on the nomenclature; and Dr. Toshiaki Kuramochi, NSMT, for the photocopies of some of the references cited.

References

Belous, E. V., 1952. [Parasitic worms of freshwater verte-

- brates of Primorskii Kraï.] Dissertation. Cited by Koval' (1966). (In Russian.)
- Koval', V. P., 1966. [Family Allocreadiidae Stossich, 1903.] In K. I. Skryabin (ed.), [Trematodes of Animals and Man], **22**: 184–310. (In Russian.)
- Koval', V. P., 1972. On the problem of independence of the species *Allocreadium baueri* Spassky et Roytman, 1960 (Trematodoidea). *Vest. Zool.*, **6**: 56–61. (In Russian, with English summary.)
- Moravec, F., 1984. Systematic status of *Allocreadium carparum* Odening, 1959 (Digenea) and three other related species from fishes of Czechoslovakia. *Folia Parasitol.*, **31**: 215–224.
- Park, J. T., 1939. Trematodes of fishes from Tyôsen. III. Some new trematodes of the family Allocreadiidae Stossich, 1904 and the genus *Macrolecithus* Hasegawa and Ozaki, 1926. *Keizyô J. Med.*, **10**: 52–62, pl. 6.
- Rees, G., 1968. *Macrolecithus papilliger* sp. nov. (Digenea: Allocreadiidae, Stossich, 1904) from *Phoxinus phoxinus* (L.). Morphology, histochemistry and egg capsule formation. *Parasitology*, **58**: 855–878.
- Shimazu, T., 1988. Trematodes of the genus *Allocreadium* (Allocreadiidae) from freshwater fishes of Japan. *Bull. Natn. Sci. Mus., Tokyo*, Ser. A, **14**: 1–21.
- Shimazu, T. & K. Hashimoto, 1999. A new species of the genus *Allocreadium* (Digenea, Allocreadiidae) from freshwater fishes of Japan. *Bull. Natn. Sci. Mus., Tokyo*, Ser. A, **25**: 27–31.

